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IMPACT OF BRANCH PULMONARY ARTERY STENOSIS ON RIGHT VENTRICULAR VOLUME OVERLOAD IN PATIENTS WITH REPAIRED TETRALOGY OF FALLOT

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Background: Right ventricular volume overload secondary to pulmonary regurgitation is common in patients after initial repair for tetralogy of Fallot (TOF). The impact of branch pulmonary artery (BPA) stenosis in this setting has not been rigorously studied.

Methods: We retrospectively reviewed 226 cardiac magnetic resonance studies in patients after initial repair for TOF. BPAs were measured proximally, distally, and at the narrowest portion. BPA stenosis was analyzed in 3 ways: 1) the Nakata index, using the smallest cross sectional area (CSA) of each BPA, 2) differential pulmonary blood flow (DPBF) deviation from normal (RPA 55%, LPA 45%), and 3) differential fractional BPA CSA (DCSA), the absolute value of the difference between the fractions of each BPA CSA divided by the sum of the two. Associations between BPA size, right ventricular end diastolic volume (RVEDV), main pulmonary artery regurgitant fraction (RF) and BPA regurgitant fraction were investigated. Spearman correlation and linear regression were performed.

Results: The mean RVEDV of the cohort was 145 ± 40 ml, the mean RF was 41 ± 16%, and the mean Nakata index of the cohort was 325 ± 143. A high Nakata index was associated with higher RF ($p=0.048$) and RVEDV ($p<.01$). For those with a Nakata index < 200, the mean RVEDV was 129 ± 32, and for those with a Nakata index > 200, it was 146 ± 38 ($p=.028$). 18 patients had bilateral BPAs stenosis as defined by Nakata index < 200 and DCSA ≤ 33%. These patients had a lower RVEDV (128 ± 27) compared to the rest (144 ± 38, $p=.037$). There was no association between DPBF deviation and RVEDV ($p=.60$) or RF ($p=.58$), or between DCSA and RVEDV ($p=.63$) or RF ($p=.73$). Smaller RPA CSA and smaller LPA CSA indexed to body surface area were associated with reduced RPA and LPA regurgitant fraction ($p<.01$, $p=.011$).

Conclusions: Contrary to studies on experimentally induced BPA stenosis, long-standing BPA stenosis in our population was not associated with larger RVEDV or RF. Bilateral BPA stenosis and a lower Nakata index were associated with lower RVEDV. This may be due to decreased branch RF in BPAs with proximal stenosis, the development of restrictive physiology, and/or larger BPA CSA in patients with long-standing pulmonary regurgitation.